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Filling a gap in the distribution of *Scinax rostratus* (Peters, 1863) (Anura, Hylidae) in northern Brazil, with further data on its advertisement call

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Abstract. *Scinax rostratus* is a large species of the *S. rostratus* group and has an extensive distribution throughout northern South America. We provide the first record of *S. rostratus* from the state of Roraima (municipality of Cantá), which fills a previously assumed gap in this species' distribution. We also describe the species' advertisement call from this locality, providing further notes on the call emission pattern and fine scale temporal and spectral structure.

Key words. Anura; bioacoustics; Cantá; Roraima; South America.

Scinax rostratus (Peters, 1863) is a large species of the *S. rostratus* group and was described from Caracas, Venezuela. This species is thought to have an extensive distribution through northern South America, ranging from southern Panama to eastern Venezuela (Peters 1863, Rivero 1968, Duellman 1972, Gorzula & Señaris 1998, Barrio-Amorós et al. 2004). A record of *S. rostratus* from French Guiana by Duellman (1972) was later attributed to a new species, *S. jolyi* Lescure & Marty, 2000. Furthermore, Sturaro et al. (2010) provided an updated distribution map to *S. rostratus*, which included the first record from Brazil (municipalities of Aveiro and Vitória do Xingu, state of Pará; Fig. 1). Thus, there was an implied distribution gap of more than 1000 km.

Herein we provide the first record of *S. rostratus* from the state of Roraima, Brazil. The new record, from the municipality of Cantá, fills the previously assumed distribution gap. We also describe this species' advertisement call from this locality, providing further notes on the call emission pattern and fine scale temporal and spectral features.

Fieldwork was conducted in Igarapé Santa Cecília, municipality of Cantá (02°45′59″ N, 060°36′32″ W, datum WGS84, ca. 70 m above sea level), state of Roraima (RR), northern Brazil (Fig. 1). Four males were collected and identified based on the description provided by Duellman (1972). Seven males were recorded with a Marantz PMD 671 digital recorder (set at sampling rate of 44.1 kHz and 24-bits resolution) coupled to a Sennheiser K6/ME67 directional microphone. The recordings were made between 25–28 July 2016, around 19:30 h to 20:30 h at temperatures of 28–29 °C (air and water). Calls were analyzed utilizing the software Raven Pro 1.5 (Bioacoustics Research Program 2014) with the following settings: window type Hann, window size of 256 samples, overlap (locked) of 90% and hop size of 0.590 ms, Discrete Fourier Transform (DFT) of 1024 samples with a grid spacing of 43.1 Hz. Temporal traits were directly measured in the oscillogram, and spectral traits were measured in the spectrogram. Dominant frequency, lower frequency band (LFB) and higher frequency band (HFB) of entire call (see results) were measured through the "peak frequency" function. Brightness and contrast of spectrogram were set at 50% and 85%, respectively, to better visualize both LFB and HFB. Sound figures were made in the Seewave package v. 1.7.6 (Sueur et al. 2008) in R platform v. 3.3.1 (R Core Team 2016), with the following settings: window = Hanning, overlap = 85% and FFT = 256 samples.

Specimens (collected with permit: ICMBio/SISBIO #02015.008064/02-51) and recordings are housed in the Coleção de Anuros do Museu de Biodiversidade do Cerrado, Universidade Federal de Uberlândia (AAG-UFU; Uberlândia, Minas Gerais, Brazil). Specimens museum accession numbers are: *Scinax rostratus* – Cantá (RR) AAG-UFU 5573 and 5574 (call voucher males), 5575 and 5576.

We were able to identify the specimens (n = 4 males; Fig. 2) based on the following traits provided by Duellman (1972): no row of tubercles along edge of lower jaw; snout lacking a fleshy proboscis; no tubercles on heel; in life, posterior surfaces of thighs orange with broad and vertical dark bars. Our specimens presented a darker dorsum, with skin nearly smooth bearing few tubercles in some individuals (AAG-UFU 5575 and 5576), whereas other males had a more tubercular skin (AAG-UFU 5573 and 5574). Also, specimens from Cantá (RR) had a smaller snout-to-vent length (SVL), ranging from

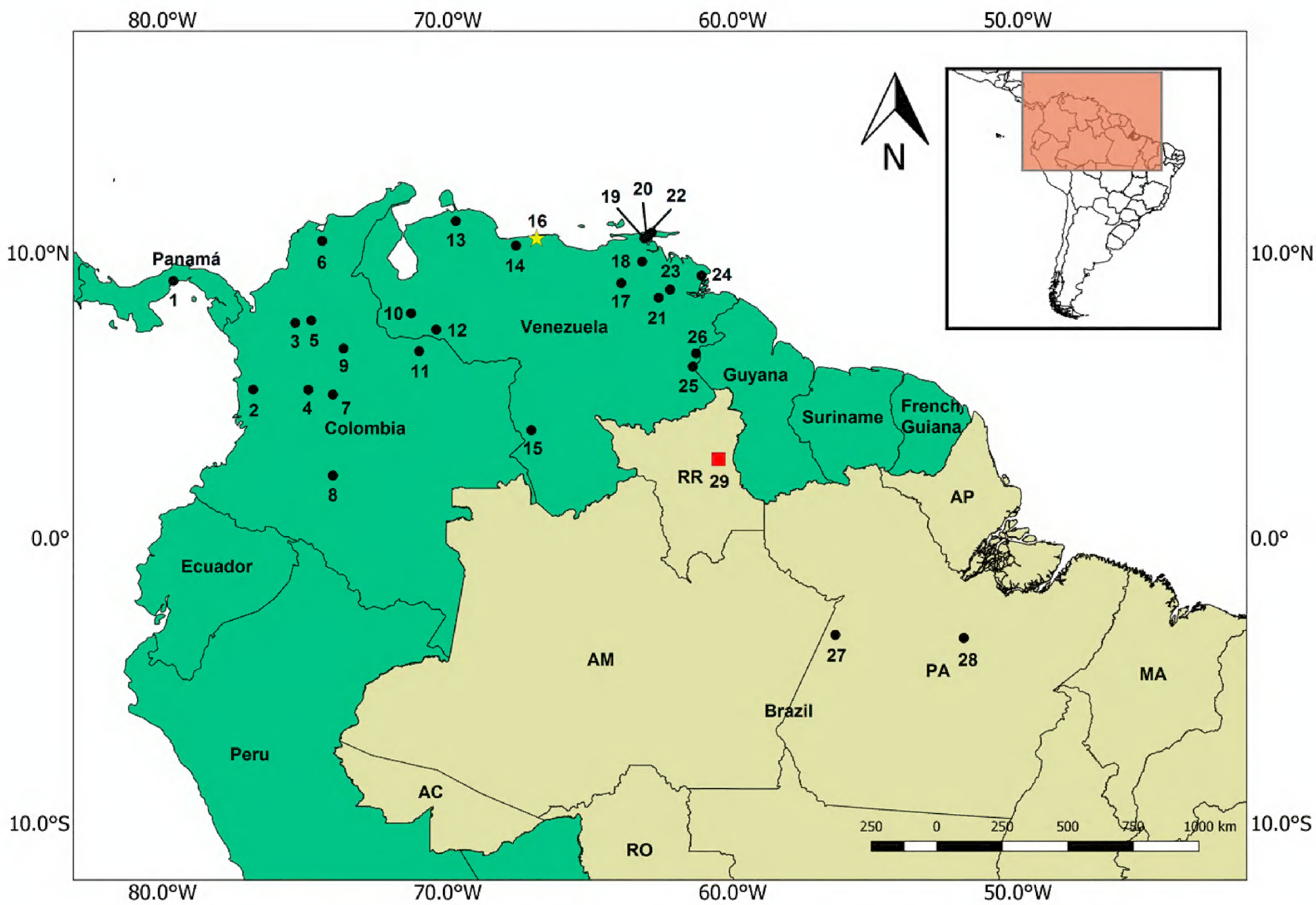

Figure 1. Geographic distribution of *Scinax rostratus* through northern South America. Yellow star represents the type locality, red square our new locality, and black circles data from the literature (PETERS 1863, RIVERO 1968, DUELLMAN 1972, GORZULA & SEÑARIS 1998, NIETO-CASTRO 1999, BARRIO-AMORÓS et al. 2004, STURARO et al. 2010). 1, north of Miraflores Locks, Canal Zone, Panama; 2, Chocó Department, Colombia; 3, Caceras, Rio Cauca, Antioquia Deparment, Colombia; 4, Mariquita, Tolima Department, Colombia; 5, El Real, Antioquia Deparment, Colombia; 6, Magdalena Deparment, Colombia; 7, Cundinamarca Department, Colombia; 8, Boca del Cano Losada, Meta Department, Colombia; 9, Santander Department, Colombia; 10, Caparo Department, Colombia; 11, Arauca Deparment, Colombia; 12, between Apure and Táchira, Táchira, Venezuela; 13, Sierra de San Luis, Venezuela; 14, Maracay, Aragua State, Venezuela; 15, Santa Bárbara, Amazonas State, Venezuela; 16, Caracas, Venezuela (type locality); 17, Momo, Anzoátegui State, Venezuela; 18, 13 km south Maturin, Monagas State, Venezuela; 19, Finca Vuelta Larga, Sucre State, Venezuela; 20, San Juan de las Galdonas, Sucre State, Venezuela; 21, San Felix/Castillos, km 4, Granja Santa Bárbara, Delta Amacuro State, Venezuela; 22, between Tunapuy and Bojoral, Sucre State, Venezuela; 23, Barrancas, Monagas State, Venezuela; 24, Caño Winikina, Delta Amacuro State, Venezuela; 25, El Dorado/Santa Elena de Uairén, km 86.7, Bolívar State, Venezuela; 26, km 13 Rio Cuyuni, Bolívar State, Venezuela; 27, right margin of Mamuru River, Aveiro, Pará State, Brazil; 28, left margin of Xingu River, Comunidade Arroz Cruz, Vitória do Xingu, Pará State, Brazil; 29, Cantá, Roraima State, Brazil (new locality). States in Brazil: AC = Acre; AM = Amazonas; AP = Amapá; MA = Maranhão; PA = Pará; RO = Rondônia; RR = Roraima.

31.5 to 35.0 (mean = 33.5; SD = 1.4) in comparison to the SVL reported for specimens in DUELLMAN (1972) (SVL of 45.7 mm) and those reported in STURARO et al. (2010) (SVL of 44.2 and 50.7 mm).

Males called in open flooded areas along a forest-bordered streamlet (< 10 m wide, Igarapé) perched in grasses or bushes at heights from 30 to 50 cm above the ground.

The advertisement call of *S. rostratus* consisted of a single type of multipulsed note (Figs. 3A, B). Calls are emitted in series that have duration of 2.23–10.75 s (mean = 5.10, SD = 2.10; n = 22) and have 3–7 (mean = 3.8, SD = 1.0) calls per series. Individual calls have durations of 138–3106 ms (mean = 770, SD = 686; n = 79) with intervals of 336–2442 ms (mean = 772, SD = 471; n = 58) between them. Calls often increase gradually in duration along an emission series (= first calls shorter and last ones longer) (Fig. 3A); except in 2 cases that a last short call was emitted after the longest one. Calls have 5–102 pulses (mean = 27, SD = 23; n = 80) with a regular emission rate of 30.7–36.4 pulses/sec (mean = 33.8, SD = 1.3). The first pulse always has lower amplitude and a different shape than the remaining ones, with peak amplitude near the middle portion of the pulse (Fig. 3B); the remaining pulses with peak amplitude at onset, decaying towards the end. The first pulses last from 3 to 21 ms (mean = 16, SD = 3), middle portion pulses last from 6 to 15 ms (mean = 10, SD =2) and final pulses last from 6 to 15 ms (mean = 11, SD = 2). Calls have 2 harmonically unrelated frequency bands (Fig. 3B), the lower frequency band (LFB) peaking at 1077–1292 Hz (mean = 1201, SD = 45; n = 80) and the higher frequency band (HFB) peaking at 3144–3747 Hz (mean = 3386, SD = 147; n = 80). In 3 males, the dominant frequency corresponded to the HFB, whereas in 1 male the dominant frequency was the LFB.

Figure 2. Adult male in life of *Scinax rostratus* (AAG-UFU 5573; SVL of 31.5 mm) from the municipality of Cantá, state of Roirama, northern Brazil.

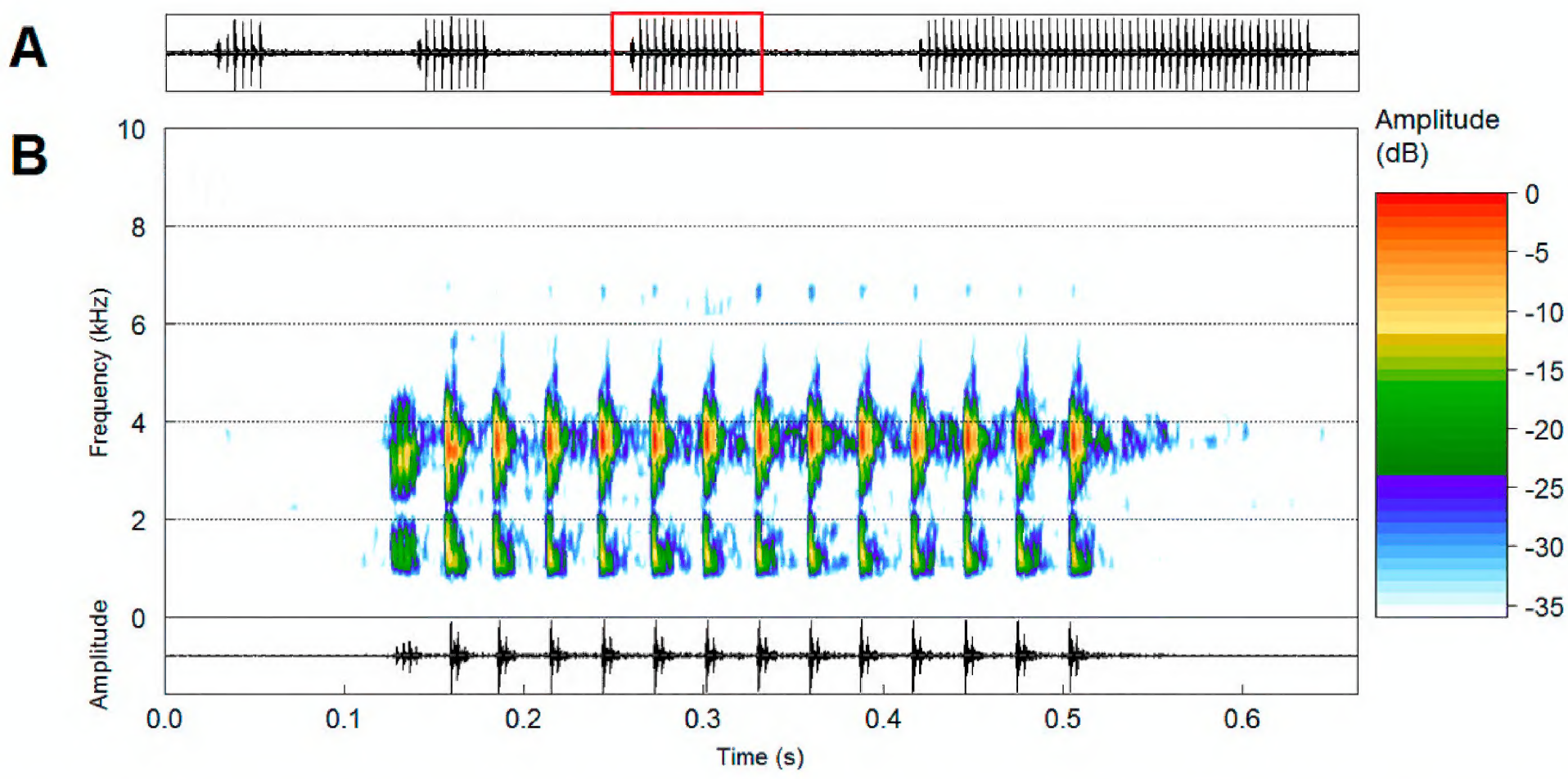

Figure 3. Advertisement calls of *Scinax rostratus* from the municipality of Cantá, Roraima state, northern Brazil. **A.** Oscillogram depicting a series of four calls. **B.** Spectrogram and corresponding oscillogram detailing the call outlined in red. Recorded on 28 July 2016, at 19:44 h. Air and water temperatures at 29 °C. Sound file = Scinax_rostratusCantaRR7aAAGm671 (the sound file is deposited in the AAG-UFU's sound collection).

Sturaro et al. (2010) presented the first records of *S. rostratus* to Brazil, in the municipalities of Aveiro and Vitória do Xingu, state of Pará. Both of these localities implied a gap of more than 1000 km in the distribution of *S. rostratus* from its easternmost record in Venezuela. Our new record of *S. rostratus* from Cantá is the first from the state of Roraima (Fig. 1, locality 29) and fills the gap seen in Sturaro et al. (2010). It is ca. 400 km south from the easternmost previous record of the species in Venezuela (Fig. 1, locality 25) and a nearly 800 km northwest from the westernmost record of the species in

the state of Pará (Fig. 1, locality 27). Accordingly, *S. rostratus* shows an extensive distribution (Fig. 1) and additional field surveys in adjacent areas (such as the states of Amazonas and Amapá, and other localities in Roraima and Pará) would shed light on the actual distribution of the species in northern Brazil.

The advertisement call of *Scinax rostratus* from Cantá agrees in general with that presented by Duellman (1972) (7 recorded males in that study). However, some slight differences were found in pulse rate (50–60 pulses/sec; Duellman 1972). We consider the differences found in this trait as representing intraspecific variation, or even differences of measurement methodologies. Our report includes previously unrecognized details in call emission pattern (increase in duration from beginning to the end), as well as in fine scale pulse structure and the variable dominance regarding the LFB and HFB. The presence of 2 emphasized frequency bands might be related to mating preferences (Wells 2007, Magrini et al. 2011). Further, the emission pattern of gradually increasing the call duration within a call series is likely to be a response for competing males in which a male enhances the attractiveness of its call over ones of neighboring males (Wagner 1989). It is noteworthy that these behavioral inferences are only speculative and further investigation is necessary to confirm it. As well, descriptions of advertisement calls from other localities are also necessary to assess the intraspecific variation within this species' call.

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